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A RAND NOTE

ADA 12536

RAND DATA BASE OF SOVIET HIGH-CURRENT  
PARTICLE-BEAM R&D

Simon Kassel

December 1982

N-1949-ARPA

Prepared for

The Defense Advanced Research Projects Agency



83 03 11 04 2

07 1983  
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The research described in this report was sponsored by the Defense Advanced Research Projects Agency under ARPA Order No. 3520-17, Contract No. MDA903-82-C-0067, Director's Office.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER N-1949-ARPA	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Rand Data Base of Soviet High-Current Particle-Beam R&D		5. TYPE OF REPORT & PERIOD COVERED Interim Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Simon Kassel		8. CONTRACT OR GRANT NUMBER(s) MDA903-82-C-0067
9. PERFORMING ORGANIZATION NAME AND ADDRESS The Rand Corporation, 1700 Main Street, Santa Monica, CA 90406		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Defense Advanced Research Projects Agency, Department of Defense, Arlington, VA 22209		12. REPORT DATE December 1982
		13. NUMBER OF PAGES 12
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) AD NO A125536		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release: Distribution Unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) No Restrictions		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) <div style="display: flex; justify-content: space-between;"> <div> <u>Particle Beams</u>  <u>Particle Accelerators</u>  <u>Soviet</u> </div> <div> <u>Data acquisition</u>  <u>Technical reports</u>  <u>Interim report</u> </div> </div>		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <div style="display: flex;"> <div style="flex: 1;">           See reverse side   <u>Data Base</u> </div> <div style="flex: 1;"> <u>Electron beam</u>  <u>Microwave generator</u>  <u>Plasma discharges</u>  <u>Lasers</u> </div> </div>		

*This report*

Describes an automated data base that

was established under the Rand project,

"Analysis and Comparison of US/USSR

Technology." The data base includes

information extracted from some 90 Soviet

technical journals specializing in physics,

engineering, and related fields, and covers

some 3000 technical reports and reviews

originated by over 4000 authors, most of

whom are affiliated with 65 research

institutions. Reports may be generated

from the data base by sorting the following

variables in any combinations: author,

institute, research team, primary subject,

secondary subject, year of publication,

and file card number.

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PREFACE

This Note describes Rand's automated data base of Soviet high-current particle-beam R&D. The data base was established to support research in the Rand project "Analysis and Comparison of US/USSR Technology," sponsored by the Director's Office, Defense Advanced Research Projects Agency. The purpose of the project is to make comparative evaluations of selected areas of Soviet science and technology that are potentially significant to the development of advanced weapons systems. The data base will therefore be expanded in the future to cover topics other than the single one described here.

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RAND DATA BASE OF SOVIET HIGH-CURRENT PARTICLE-BEAM R&D

INTRODUCTION

An automated data base of Soviet high-current particle-beam R&D has been established as a part of the Rand project "Analysis and Comparison of US/USSR Technology," sponsored by the Director's Office, Defense Advanced Research Projects Agency. The purpose of the project is to make comparative evaluations of selected areas of Soviet science and technology that are potentially significant to the development of advanced weapons systems.

The project depends heavily on a large-scale input of open-source Soviet scientific and technical literature. The research consists of detailed, in-depth analyses of the technical and bibliographic content of the individual research reports and reviews that make up this literature. The large volume of retrospective Soviet material accumulated thus far, and the relatively high acquisition rate of new materials, have created a need for a computer-processed system for storage, retrieval, and analysis of the input data necessary for the project.

The automated data base is at present limited to the area of high-current particle-beam R&D, considered the most demanding of the project's specialized research topics in terms of input volume and the need for advanced analytic techniques. The following is a brief description of the data base.



## STRUCTURE AND FUNCTIONS OF THE DATA BASE

The Rand automated data base of Soviet high-current particle-beam R&D is maintained on an IBM 370/3032 computer. It includes information that has been extracted from some 90 Soviet technical journals specializing in physics, engineering, and other related fields. The data base is used to monitor and analyze Soviet work in the particle beam field that has been published during the last 15 years. Selected data elements are entered interactively using the WYLBUR text editing system, and are stored on disk by Soviet institute for immediate retrieval. Additional outputs are produced in a batch mode, using a series of PL/I and Statistical Analysis System (SAS) programs designed to produce reports which may be printed, stored, or routed to a terminal for viewing and editing. A backup copy of the data base is maintained on magnetic tape and is updated periodically. The present data base contains information from some 3000 technical reports and reviews originated by over 4000 authors, most of whom are affiliated with 65 identified research institutions.

Reports may be generated by sorting the following variables in any order or any combination:

- o Author
- o Institute
- o Research Team
- o Primary Subject

- o Secondary Subject
- o Year of Publication
- o File Card Number

Hard-copy output may be obtained for any subset of the variables.

The institutional affiliation of the individual papers and authors is determined first from published affiliation statements and second from the process of correlating coauthors, subject areas, and the year of publication. Such correlation also aids in defining the individual research teams associated with each institute and the specialized research projects assigned to the teams.

The subject classification system has been designed to provide flexibility in researching a broad range of problems relating to the substance, organization, level of effort, and structure of Soviet particle-beam R&D, and includes headings that identify basic and applied research, hardware construction, and technological applications of particle beams.

The automated data base is backed by a specialized Rand library containing nearly one hundred Soviet scientific and technical journal titles covering 20 years of publication, and hard copies of all papers represented in the data base.

The following appendixes give the details of the subject classification system, a list of Soviet institutes active in the field, and a sample format of the data base entries.

Appendix A

PARTICLE-BEAM CLASSIFICATION SYSTEM

-----  
A C C E L E R A T O R S   A N D   C O M P O N E N T S  
-----

No.	Designation
-----	-----
010	ACCELERATORS, general
011	direct diode
012	linear induction
013	radial line
014	betatrons
015	electron ring
016	cyclic and storage rings
017	autoaccelerators
018	RF, gyrocons
019	sub-nsec accelerators
020	ACCELERATORS, ion
021	collective
022	
023	
024	ion sources
025	surface plasma
026	charge exchange
027	duoplasmatrons
028	PIG
029	heavy ion
030	multiply-charged ions
040	NEUTRAL BEAM GENERATORS
041	neutral atom injectors
042	neutral beam sources
043	neutralizer targets (e strippers)
045	NEUTRON GENERATORS
070	ACCELERATORS, plasma
071	rail
072	coaxial
073	plasmatoms
074	plasma focus
075	pinch
076	UZDP
077	

No.	Designation
-----	-----
100	ACCELERATOR COMPONENTS
110	switches
111	closing
112	closing, rep. rated
113	opening
114	opening, rep. rated
115	
116	
120	diodes
121	field emission, nsec
122	field emission, microsec.
123	field emission, msec.
124	magnetic insulation
125	explosive field emission
126	plasma cathodes
127	thermionic emission
128	electron guns, sources
129	atmospheric extraction windows
130	high-voltage insulation
131	
132	
133	electrode erosion
135	intermediate storage
140	pulse-forming lines, Blumleins
141	oil
142	water
143	glycerine
144	other insulators
145	magnetic insulation lines
150	post-acceleration inductors
155	modulators
160	voltage generators, Marx generators
165	diagnostics

No.	Designation
200	PULSED-POWER COMPONENTS
201	primary power
205	capacitor banks
211	pulsed transformers
220	inductive storage
221	homopolar generators
222	
223	
224	
225	rotating machines
230	magnetic flux compressors
235	HE-driven
236	electric-driven
237	nuclear-driven
240	compression of material
245	compression of liners
260	superconducting magnets
270	pulsed MHD generators
275	explosive
276	nuclear
277	light sources
278	ultraviolet

290	OTHER COMPONENTS
280	

B E A M D Y N A M I C S

No.	Designation
300	ELECTRON BEAM DYNAMICS
310	beam generation
311	nsec beams
312	microsec beams
320	beam transport
321	in air
322	in gas and vacuum
323	in magnetic field
324	in plasma
325	
326	
327	beam trajectory control
328	
329	
330	beam instabilities
331	hose
332	
333	
334	beam pulse conditioning
335	critical current and neutralization

No.	Designation
336	anomalously fast electrons
337	beam diagnostics
338	autoacceleration
339	
340	beam interactions
341	with air
342	with neutral gas
343	with plasma
344	with solids
345	
346	channeling in crystals
350	cyclic accelerator dynamics
400	ION BEAM DYNAMICS
401	beam generation
402	beam conditioning
403	double charge exchange (vapor targets)
404	ion beam transport
410	negative ions
411	beam transport
420	positive ions
421	beam transport
430	heavy ions
434	neutral atoms
435	neutral atoms, diagnostics
440	ion beam interactions
441	with neutral gas
442	with plasma
443	with solids
450	particle acceleration
455	collective acceleration methods
460	ion beam diagnostics
470	PLASMA DYNAMICS
471	plasma focus
500	ELECTRIC DISCHARGES
510	vacuum and low pressure
515	high pressure
516	air as discharge medium
517	water as discharge medium
520	non-self-sustaining
521	e-beam maintained
530	exploding wires
540	microwave gas breakdown
545	laser-induced air breakdown
547	pinch
550	arc
560	sliding

A P P L I C A T I O N S

No.	Designation
570	APPLICATIONS OF HIGH MAGNETIC FIELDS
600	MICROWAVE GENERATION
610	Cherenkov generators
620	cyclotron masers (gyrotrons)
630	e-beam int. with solid-state plasma
635	ondulator radiation
640	plasma electronics
650	LASERS
660	laser pumping
670	free electron lasers
690	FLASH X-RAYS
695	soft x-rays
700	FUSION
710	magnetic confinement
711	e-beam heating
712	ion-beam heating
713	plasma heating
714	tokomaks and mirror machines
715	ion and atom injection
720	inertial confinement
730	electrons
731	target interaction
740	ions
741	target interaction
760	fusion engineering
800	OTHER APPLICATIONS
803	e-beam working of materials
810	isotope separation
820	e-beam driven chemical reactions
830	beam weapons
840	long-dist. energy transport
850	ionospheric injection, charged particles
860	ionospheric injection, microwaves
870	generation of high pressures
900	NEW IDEAS

Appendix B

SOVIET INSTITUTES ACTIVE IN PARTICLE-BEAM R&D

(1)	(2)	(3)	(4)	(5)
001	LGU	LENINGRAD STATE UNIVERSITY	VUZ-RSFSR	LENINGRAD
002	FIAN	LEBEDEV PHYSICS INSTITUTE	AN	MOSCOW
003	IOA	INSTITUTE OF ATMOSPHERIC OPTICS	SOAN	TOMSK
004	SKDBA	SPECIAL DESIGN BUREAU FOR X-RAY EQUIPMENT		LENINGRAD
005	KHFTI	PHYSICO-TECHNICAL INSTITUTE	AN-UK	KHAR'KOV
006	ITPM	INSTITUTE OF THEORETICAL AND APPLIED MECHANICS	SOAN	NOVOSIBIRSK
007	IYAF	NUCLEAR PHYSICS INSTITUTE	SOAN	NOVOSIBIRSK
008	PGU	PETROZAVODSK STATE UNIVERSITY	VUZ	PETROZAVODSK
009	HGU	MOSCOW STATE UNIVERSITY	VUZ-RSFSR	MOSCOW
010	IFTT	SOLID STATE PHYSICS INSTITUTE	AN	CHEMNIGOLOVKA
011	SFTI	PHYSICO-TECHNICAL INSTITUTE	AN GSSR	SIBIRI
012	IAE	KURCHATOV INSTITUTE OF ATOMIC ENERGY	SCUAE	MOSCOW
013	GNIEI	KRZHIZHANSKIY STATE SCIENTIFIC RESEARCH ENERGY INST		MOSCOW
015	YEGU	YEREVAN STATE UNIVERSITY	VUZ, ARSSR	YEREVAN
016	IYAFANX	NUCLEAR PHYSICS INSTITUTE	AN KAZAKH SSR	ALMA ATA
017	LEIS	INSTITUTE OF ELECTRICAL ENGINEERING OF MINN COFM		LENINGRAD
018	IKI	INSTITUTE OF SPACE RESEARCH	AN	MOSCOW
019	IYAFEA	NUCLEAR PHYSICS ELECTRONICS & AUTOMATION	VUZ	TOMSK
020	GPI	GORKIY POLYTECHNIC INSTITUTE	VUZ	GORKIY
021	IATE	INSTITUTE OF AUTOMATION AND ELECTROMETRY	SOAN	NOVOSIBIRSK
022	IRE	MOSCOW RADIO TECHNICAL AND ELECTRONICS INSTITUTE	AN	MOSCOW
024	VNIIEA	ALL-UNION SCIENTIFIC RESEARCH INST FOR ELECTRICAL EQPT		KHAR'KOV
025	IFAN	PHYSICS INSTITUTE	AN-UK	KIEV
026	NIRFI	INSTITUTE OF RADIO PHYSICS	VUZ	GORKIY
027	NIIIEFA	VEFREMOV INSTITUTE OF ELECTROPHYSICAL EQUIPMENT	SCUAE	LENINGRAD
028	ITEF	THEORETICAL AND EXPERIMENTAL PHYSICS INSTITUTE	SCUAE	MOSCOW
029	TPI	TOMSK POLYTECHNIC INSTITUTE	VUZ	TOMSK
030	LPI	LENINGRAD POLYTECHNIC INSTITUTE	VUZ	LENINGRAD
031	BAUMAN	BAUMAN TECHNICAL COLLEGE	VUZ-RSFSR	MOSCOW
032	NIIHFSGU	MECHANICS AND PHYSICS INSTITUTE	VUZ	SARATOV
033	OIVAI	JOINT INSTITUTE OF NUCLEAR RESEARCH	SCUAE	DUBNA
034	IVTAN	HIGH TEMPERATURE INSTITUTE	AN	MOSCOW
035	IVN	INSTITUTE OF HIGH VOLTAGE	VUZ	TOMSK
036	KHGU	KHAR'KOV STATE UNIVERSITY	VUZ	KHAR'KOV
037	IFANG	TBILISI PHYSICS INSTITUTE	ANGSSR	TBILISI
038	FTI	IOFFE PHYSICS TECHNICAL INSTITUTE	AN	LENINGRAD
039	IFP	INSTITUTE OF PHYSICS PROBLEMS	AN	MOSCOW
040	MEI	MOSCOW POWER ENGINEERING INSTITUTE	VUZ-RSFSR	MOSCOW
041	IASUR	AUTOMATED MANAGEMENT SYSTEMS AND RADIOELECTRONICS		TOMSK
042	IYAFHGU	NUCLEAR PHYSICS INSTITUTE	VUZ	MOSCOW
043	HAI	MOSCOW AVIATION INSTITUTE		MOSCOW
044	IYAI	NUCLEAR RESEARCH INSTITUTE	AN	MOSCOW
045	IG	INSTITUTE OF HYDRODYNAMICS	SOAN	NOVOSIBIRSK
046	IPM	INSTITUTE OF APPLIED MATH	AN	MOSCOW
047	IEH	ALL-UNION ELECTRICAL MACHINE BUILDING RESEARCH INSTITUTE	HEEI	LENINGRAD
049	VEI	ALL-UNION ELECTRIC ENGINEERING INSTITUTE	HEEI	MOSCOW



050 GIAP	STATE SCIENTIFIC RESEARCH AND PLANNING INST (NITROGEN)	NCI	MOSCOW
052 SIBIZMIR	SIBERIAN INST(EARTH MAGNETISM IONOSPHERE & RADIOWAVE PROP)	SOAN	IRKUTSK
053 HIREA	MOSCOW RADIOTECHNICAL ELECTRONICS AND AUTOMATION INST		MOSCOW
054 HIFI	MOSCOW ENGINEERING PHYSICS INSTITUTE	VUZ	MOSCOW
055 HFTI	MOSCOW PHYSICO-TECHNICAL INSTITUTE	VUZ	MOSCOW
056 IOFI	INSTITUTE FOR OPTICO-PHYSICAL MEASUREMENTS	SCS	MOSCOW
057 KGU	KIEV STATE UNIVERSITY (SHEVCHENKO)	VUZ-UKSSR	KIEV
058 ISE	HIGH CURRENT ELECTRONICS INSTITUTE	SOAN	TOMSK
059 IPF	APPLIED PHYSICS INSTITUTE	AN	GORKIY
060 SKBFTI	SPECIAL DESIGN BUREAU PHYSICS-ENGINEERING INSTITUTE	AN	LENINGRAD
062 IYAIK	NUCLEAR RESEARCH INSTITUTE KIEV	AN UKSSR	KIEV
063 SKBAA	SPECIAL DESIGN BUREAU FOR X-RAY EQUIPMENT	AN	LENINGRAD
064 KHPI	KHAR'KOV POLYTECHNICAL INSTITUTE	VUZ	KHAR'KOV
065 P	PAVLOVSKIY		UNKNOWN
066 MISC			
067 NOAFFIL			
068 KPI	KIEV POLYTECHNICAL INSTITUTE	VUZ-UKSSR	KIEV
069 TGPI	TOMSK STATE TEACHERS INSTITUTE	VUZ	TOMSK
070 IED	INSTITUTE OF ELECTRO DYNAMICS	AN USSR	KIEV
071 KIRE	KHAR'KOV RADIOPHYSICS AND ELECTRONICS INSTITUTE	AN UKSSR	KHAR'KOV
072 FEI	PHYSICAL POWER INSTITUTE	AN LSSR	RIGA
074 RAIAN	RADIOTECHNICAL INSTITUTE		UNKNOWN
075 VNIIMS	METROLOGICAL SERVICE	SCS	MOSCOW
076 PKBE	DESIGN AND PLANNING BUREAU OF ELECTRO-HYDRAULICS	AN UKSSR	UNKNOWN
077 PASSOC			
078 GOI	VAVILOV OPTICS INSTITUTE	MDI	VAVILOV

#### LEGEND

- (1) INSTITUTE CODE
- (2) INSTITUTE ABBREVIATION
- (3) INSTITUTE NAME
- (4) AFFILIATION
- (5) LOCATION

#### INSTITUTE AFFILIATION AND CODES

(1)	(2)	
VUZ-RSFSR	- MIN. HIGHER & SEC SPEC ED, RSFSR	<div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">LEGEND</p> <p>(1) JURISDICTION</p> <p>ABBREVIATION</p> <p>(2) JURISDICTION</p> <p>EXPANSION</p> </div>
AN	- USSR ACADEMY OF SCIENCES	
AN-UK	- UKSSR ACADEMY OF SCIENCES	
REEI	- MIN. ELEC. EQUIP. INDUSTRY, USSR	
SCUAE	- ST. COMM. FOR UTIL. OF ATOMIC ENERGY, USSR	
NCI	- MIN. CHEM. INDUSTRY, USSR	
SCS	- ST. COMM. FOR STANDARDS, USSR	
MDI	- MIN. DEFENSE INDUSTRY, USSR	
MIN COMM	- MIN. OF COMMUNICATIONS, USSR	
SOAN	- SIBERIAN BRANCH, AN	

# Appendix C

## SAMPLE FORMAT OF DATA BASE ENTRIES FOR ONE INSTITUTE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ALTYNTSEV	A T	000188	052	01	470	000	82	
ALTYNTSEV	A T	000890	052	01	470	710	77	
ALTYNTSEV	A T	001259	052	01	470	710	74	
ALTYNTSEV	A T	001267	052	01	470	000	73	
ALTYNTSEV	A T	001333	052	01	450	000	78	
ALTYNTSEV	A T	001902	052	01	470	710	79	
ALTYNTSEV	A T	002651	052	01	470	710	81	
ALTYNTSEV	A T	002941	052	01	470	000	81	
ASTRAKHANTSEV	N V	001699	052	01	442	000	79	
BARDAKOV	V N	001512	052	03	714	000	80	
BARDAKOV	V M	001686	052	03	714	000	78	
BARDAKOV	V M	002255	052	03	714	000	77	
BARDAKOV	V M	002941	052	01	470	000	81	
BORZENKO	V P	002160	052	0M	076	000	80	
FAYNSHTEY	V G	002857	052	0M	070	000	81	
FOMICHEV	V V	002848	052	02	850	000	81	
KAPITANOV	V YA	001149	052	02	850	000	78	
KICHIGIN	G N	001699	052	01	442	000	79	
KOROTEYEV	V I	002160	052	0M	076	000	80	
KOSHILEV	N A	001267	052	01	470	000	73	
KOSHILEV	N A	002153	052	01	713	000	80	
KRASOV	V I	000188	052	01	470	000	82	
KRASOV	V I	000890	052	01	470	710	77	
KRASOV	V I	001259	052	01	470	710	74	
KRASOV	V I	001267	052	01	470	000	73	
KRASOV	V I	001333	052	01	450	000	78	
KRASOV	V I	001902	052	01	470	710	79	
KRASOV	V I	002651	052	01	470	710	81	
KRASOV	V I	002941	052	01	470	000	81	
LEBEDEV	N V	000188	052	01	470	000	82	
LEBEDEV	N V	002651	052	01	470	710	81	
MARKEYEVA	A K	002848	052	02	850	000	81	
MASALOV	V L	001267	052	01	470	000	73	
MASALOV	V L	002153	052	01	713	000	80	
MIKHALEV	A V	002160	052	0M	076	000	80	
MISHIN	YEV	001149	052	02	850	000	78	
MISHIN	YEV	001150	052	02	850	000	78	
MISHIN	YEV	001922	052	02	343	000	79	
MISHIN	YEV	002848	052	02	850	000	81	
PAPERNYY	V L	000188	052	01	470	000	82	
PAPERNYY	V L	001699	052	01	442	000	79	
PAPERNYY	V L	002651	052	01	470	710	81	
PARFENOV	O G	001267	052	01	470	000	73	
RUZHIN	YUYA	002848	052	02	850	000	81	
SHISHKO	A A	000532	052	01	100	000	74	*
SHISHKO	A A	001267	052	01	470	000	73	
SHISHKO	A A	002153	052	01	713	000	80	
SIMONOV	V G	000188	052	01	470	000	82	
SIMONOV	V G	001699	052	01	442	000	79	
SIMONOV	V G	002651	052	01	470	710	81	
STROKIN	N A	002153	052	01	713	000	80	
VAYNSHTEY	S I	001661	052	0M	470	000	79	
VOLOKITIN	A S	001150	052	02	850	000	78	
VOLOKITIN	A S	001922	052	02	343	000	79	
YESELEVIC	V G	002857	052	0M	070	000	81	
ZHULIN	I A	002848	052	02	850	000	81	

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LEGEND:
(1) AUTHOR
(2) AUTHOR'S INITIALS
(3) CARD NO.
(4) INSTITUTE CODE
(5) TEAM NUMBER
(6) PRIMARY SUBJ
(7) SECONDARY SUBJ
(8) PUB DATE
(9) * INDICATES PAPER
    NOT ON HAND
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